

# Introduction

- Occlude means to 'to close'.
- Definition: ' *Any contact between the incising or masticatory surfaces of the maxillary and mandibular teeth* ' is termed as occlusion
- Complete denture must meet three major needs
  - a). Comfort
  - b). Function
  - c). Esthetics



- Occlusion deals with the static relationship of the opposing teeth while articulation deals with the dynamic relationship of the opposing teeth.
- Occlusion is an important factor that governs the stability and retention of the complete denture.



## Important differences between natural and artificial occlusion

- Natural teeth function independently and each tooth disperses the occlusal load.
- Proprioceptive impulses from peridontium avoid the occlusal prematurities
- Artificial teeth function as a group and occlusal loads are not individually managed.
- There is no feedback & the denture rests in centric relation. Any prematurities can shift the base

- Malocclusion can be nonproblematic for yrs.
- Non vertical forces are well tolerated.
- Bilateral balance is not necessary & usually considered a hindrance
- 2nd molar favored for mastication owing to leverage & power.
- Malocclusion pose immediate drastic problems.
- Non vertical forces damage the supporting tissues.
- Bilateral balance is mandatory to produce stability of the denture.
- Heavy pressure on the 2nd molar will tilt the base on inclined foundation

# TERMINOLOGY

- **OCCLUSION:** static relationship b/w incising or masticating surfaces of maxillary or mandibular teeth or tooth analogues
- **ARTICULATION:** contact relationship b/w occlusal surfaces of teeth during function
- **CENTRIC OCCLUSION:** occlusion of opposing teeth when mandible is in centric relation
  - May or may not coincide with maximum intercuspation

- **MAXIMUM INTERCUSPATION:** complete intercuspation of opposing teeth independent of condylar position
- **EXCURSIVE MOVEMENT:** movement occurring when mandible moves away from maximum intercuspation
- **ECCENTRIC:** any position of mandible other than that which is its normal position
- **ECCENTRIC OCCLUSION:** any occlusion other than centric occlusion

## ❑ **BALANCING SIDE/NON-WORKING SIDE:**

That side of mandible which moves towards median line in lateral excursion

❑ **BALANCING INTERFERENCES:** undesirable contacts of opposing occlusal surfaces on non working side

❑ **BALANCED OCCLUSION:** Bilateral, simultaneous, anterior & posterior occlusal contacts of teeth in centric, eccentric positions



## Sears axioms of complete denture occlusion.

- è Smaller the area of the occlusion surface, the lesser is the amount of occlusal load transmitted to the supporting structures.
- è Vertical forces on a tilted occlusal surface will produce non-vertical forces on the denture.
- è Vertical forces on the denture base lying over the resilient tissues will produce lever forces on denture.
- è Vertical forces acting outside the ridge crest will produce tipping of the denture

## Occlusal scheme requisites.

Occlusal scheme has three characteristics

- 1). Incising units
- 2). Working units
- 3). Balancing units



1). Incising units- includes all the four incisors.

(a).sharp units for improved incising efficiency.

(b). The unit should not contact during mastication except during protusion.

c). Shallow incisal guidance.

(d). Increased horizontal overlap to avoid interference during settling.

2). Working units- includes the canines & the posterior teeth of the side towards which the mandible moves.

(a). Cusps for good cutting.

(b). Smaller buccolingual width to decrease the occlusal load.

(c). Group function at the end of chewing cycle in eccentric positions.

(d). The occlusal load should be directed to the anteroposterior center of the denture.

(e). Plane should be parallel to mean foundation of the ridge.



3non-working Units- includes canines & posterior teeth opposing the working side.

(a). The second molars should be contact during protrusion.

(b). They should contact the working side at the end of chewing cycle.

(c). Smooth gliding contacts.

# 1). BALANCED OCCLUSION

Reported by *Brewer*.

Definition: *The simultaneous contacting of maxillary and mandibular teeth on right and left and in the posterior and anterior occlusal areas in centric and eccentric positions.*

Significance: Normal individual makes masticatory tooth contact only for 10 mins in one day compared to 4hrs of total tooth contact during other functions. So, for these 4hrs of tooth contact, balanced occlusion is important to main denture stability.

# Objectives of balanced occlusion

- 1). To improve the stability of denture.
- 2). To reduce resorption of the residual ridge and soreness.
- 3). To improve oral comfort & well being of the patient.



# ADVANTAGES OF BALANCED OCCLUSION

## ✓ SWALLOWING-

Bilateral balance allows contacts occurring during swallowing to be made evenly without displacing base against oral mucosa

## ✓ CHEWING- helps to seat denture in stable position during terminal arc of closure

a

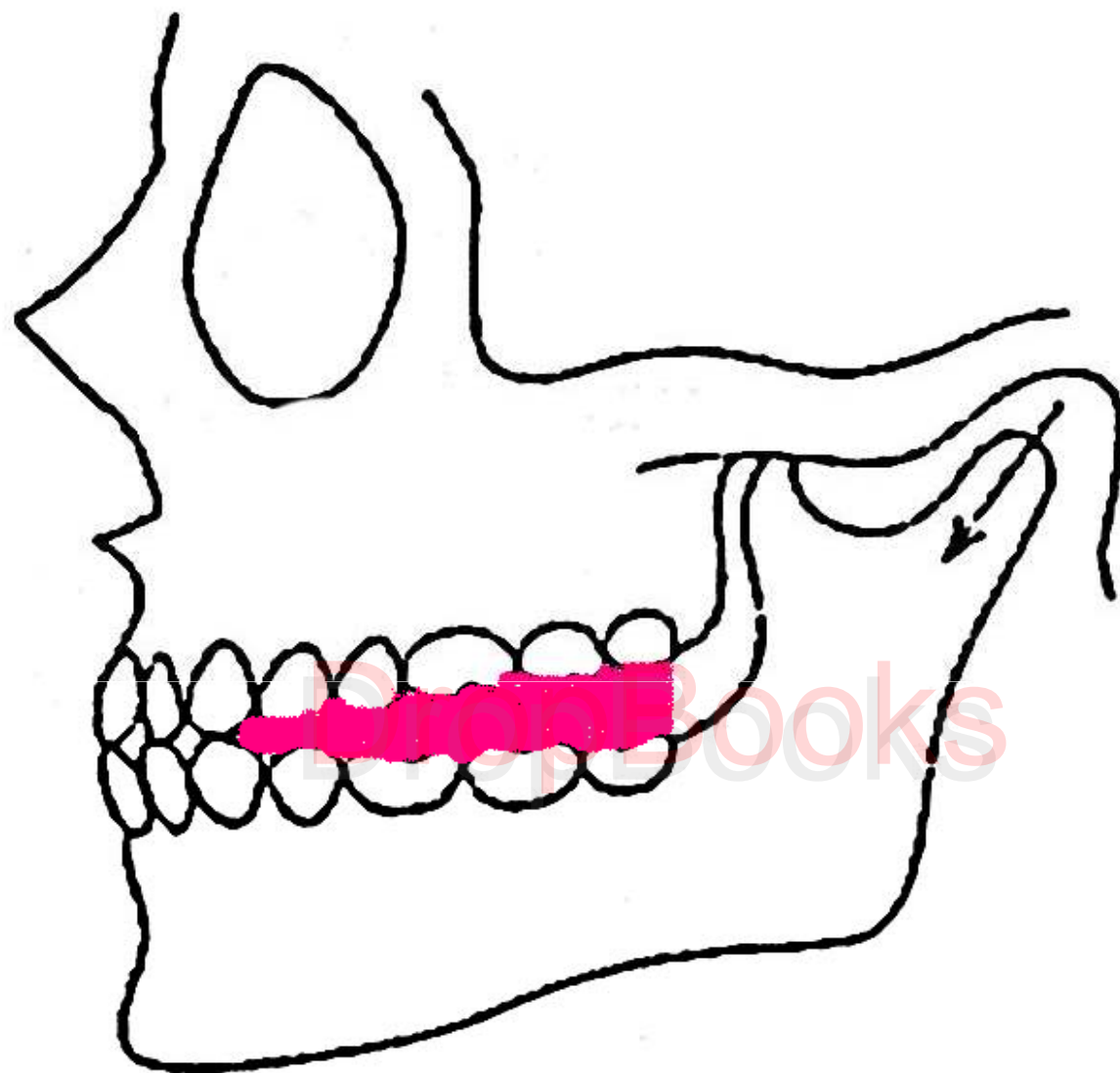
✓ PARAFUNCTIONAL MOVEMENTS:

Balanced occlusion prevents destructive lateral forces generated against basal seat during parafunctional activity

✓ CHRISTENSEN PHENOMENON:

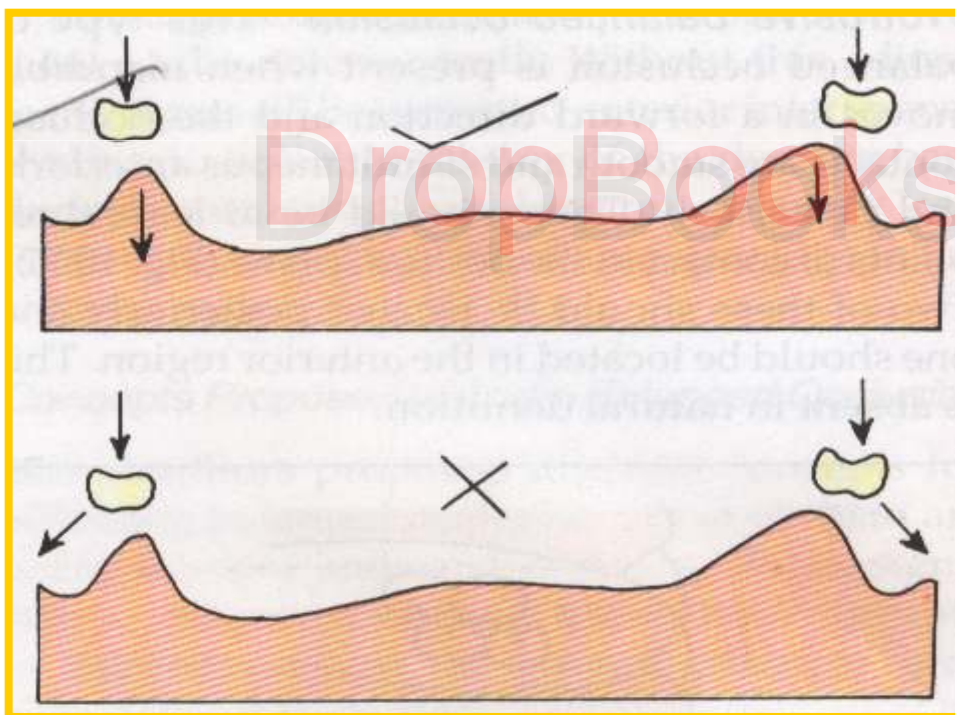
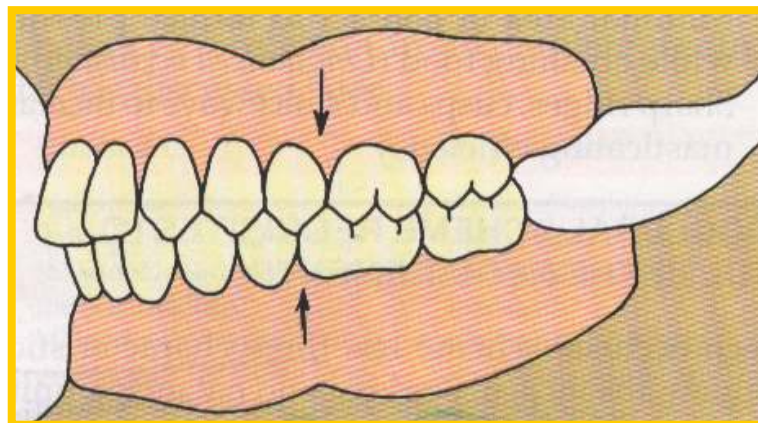
if dentures are not balanced in protrusive excursion, resulting posterior disocclusion & pressure in premolar area causes dislodgement





## General considerations for balanced occlusion

- The wider and larger the ridge & the teeth closer to the ridge, the greater the lever balance.
- Wider the ridge & narrower the teeth buccolingually, greater the balance.
- The more lingual the teeth are placed in relation to the ridge crest, the greater the balance.
- The more centered the force of occlusion anteroposteriorly, the greater the stability of the base.



# Lever balance

- This is present when there is equilibrium on the supporting structures when a bolus of food between the teeth on one side and a space exists between the teeth on the opposite side

# This state of equilibrium is encouraged by the following:

- Having the denture base cover as wide an area on the ridge as possible.
- Placing the teeth so that the resultant direction of the force on the functional side is over the crest of the ridge or slightly lingual to it.
- Placing the teeth as close to the ridge.
- Using as narrow bucco-lingual width occlusal table.

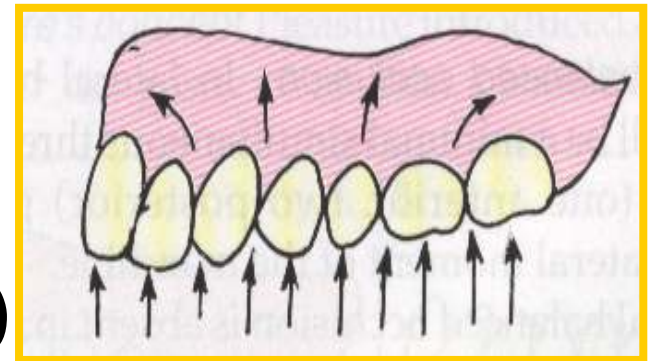
# Types of balanced occlusion

## 1). Unilateral balanced occlusion:

Type of occlusion when occlusal surfaces of teeth on one side occlude simultaneously, as a group, with a smooth uninterrupted glide.

## 2). Bilateral occlusal balance type of occlusion seen when simultaneous contact occurs on both the sides in centric and eccentric positions.

For minimal occlusal balance,  
there should be atleast  
3 point contact on occlusal  
plane (2 posterior & 1 anterior)

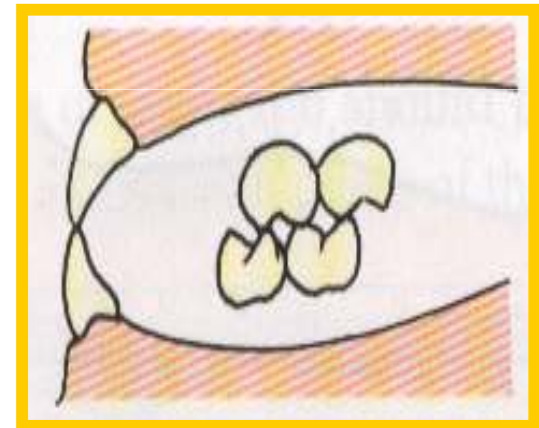


## a). Protrusive occlusal balance

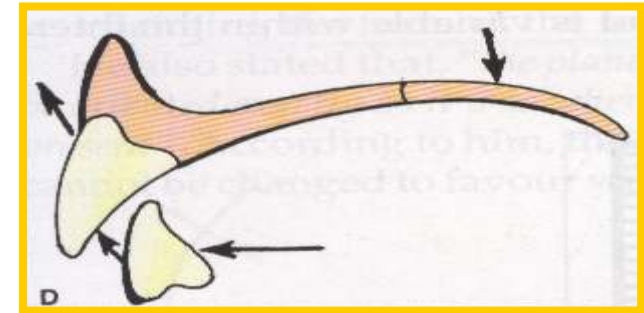
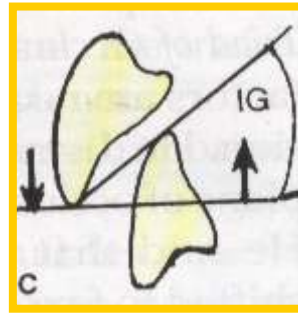
Usually seen during the protrusion of the mandible.

Factors governing protrusive balance:

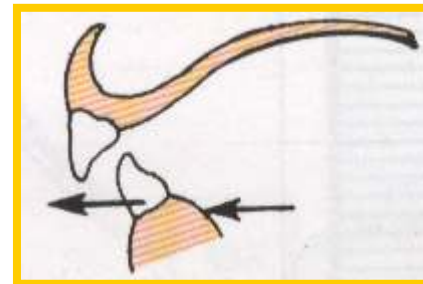
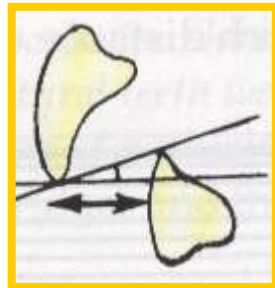
- F Inclination of condylar path
- F Angle of incisal guidance.
- F Angle of the plane of occlusion.
- F Compensating curves.
- F Cuspal height & inclination of the posterior teeth.



- denture with steep incisal guidance tend to get displaced



denture with shallow incisal guidance produce less interference





## **b).Lateral occlusal balance :**

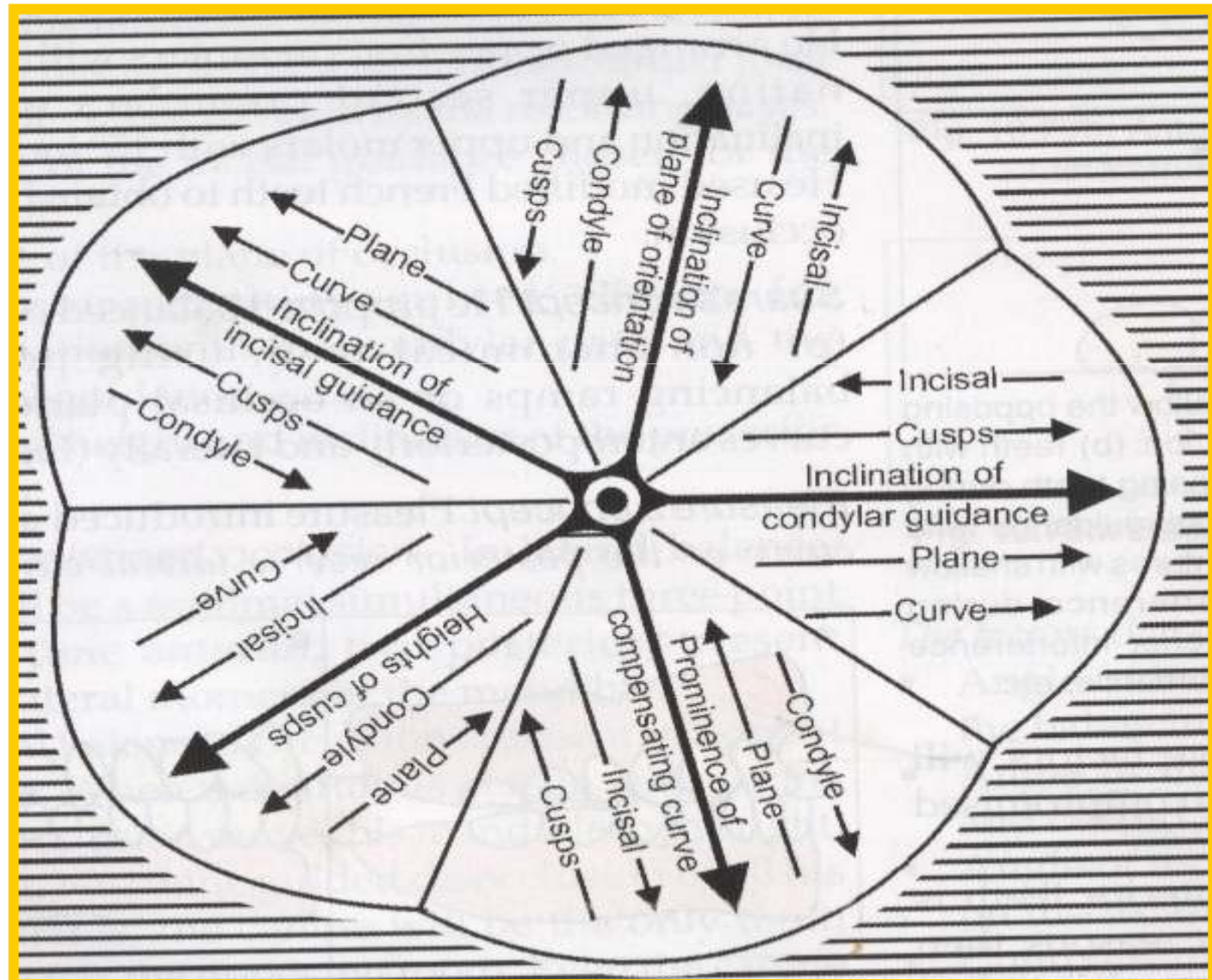
**Minimal 3 point contact during lateral moment of the mandible.Absent in normal dentition.If allowed while tooth arrangement then the denture would loose its stability due to lever action.**

**Factors :**

- F Angle of inclination of condylar path.**
- F Angle of incisal guidance.**
- F Angle of inclination of plane of occlusion**
- F Compensating curves.**
- F Buccal & lingual cusp height.**
- F The Bennett side shift on the working side.**

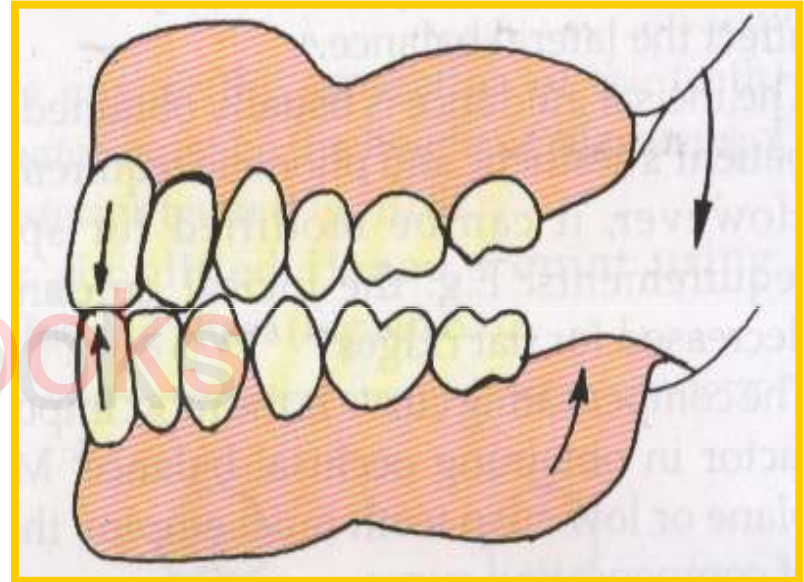
## 5). Hanua's Quint- Rudolph proposed nine factors that govern articulation of artificial teeth

- Condylar guidance
- Incisal guidance
- Compensating curves
- Relative cusp height
- Plane of orientation

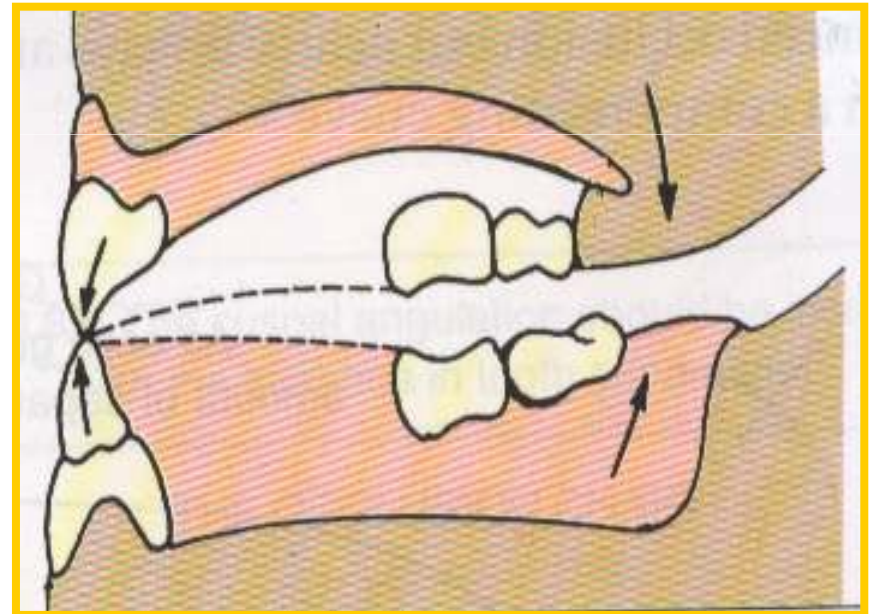


# Mechanics of balanced occlusion

In natural teeth when the mandible is protuded so that the incisal edges of the upper & the lower teeth contact, there is a gap between the upper & lower posterior teeth, this is termed as "Christensen's phenomenon".



Y But this occlusion could cause tipping of the denture in the posterior region. Thus simultaneous anterior & posterior contacts are required when mandible is protruded.

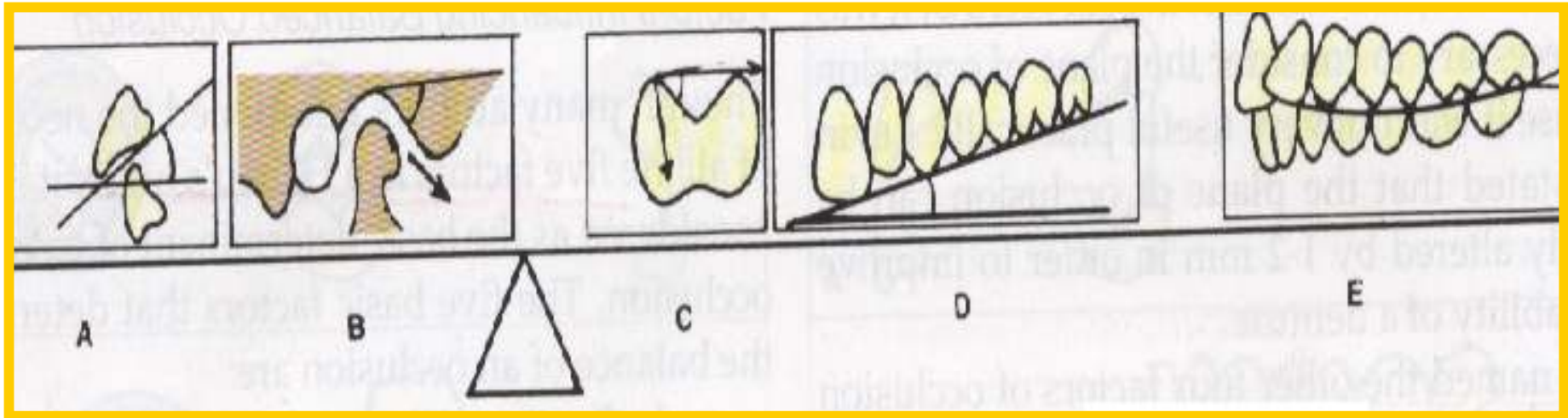


## Factors influencing balanced occlusion

- (1) Inclination of the condylar path.*
- (2). Incisal guidance.*
- (3). Orientation of the plane of occlusion*
- (4). Cuspal angulation.*
- (5). Compensating curve.*

When patients with steep incisal guidance brings his mandible forward, the movement is controlled by the lingual surface of upper anteriors thus leading to the lifting of the posterior part of denture . To prevent this other three components have to be modified





**A). Incisal guidance B). Condylar guidance  
C). Cuspal angulation D).plane of occlusion  
E). Compensating curve. A balance of these  
five factors is required for balanced  
occlusion**

## (1). CONDYLAR GUIDANCE

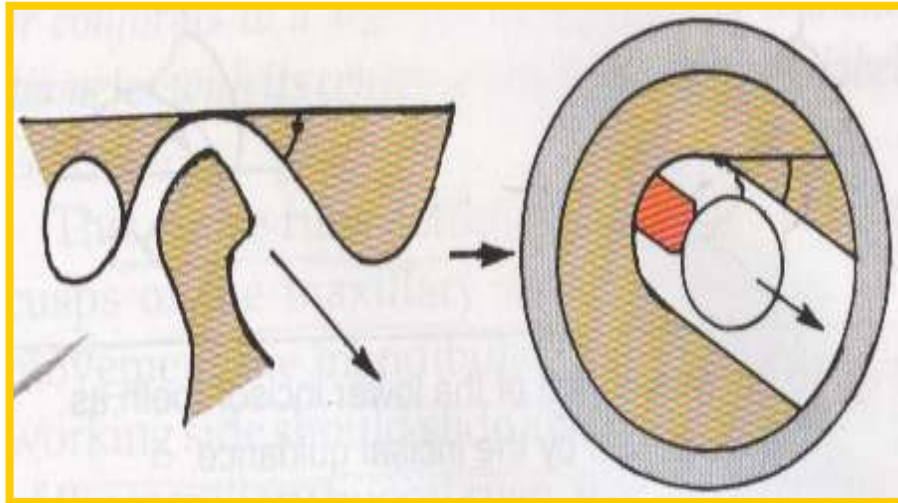
- Recorded from the patient using protrusive registration.

The interocclusal records are transferred to the articulator and then accommodated to glide freely into position.

**Mechanics:** Increase in the condylar guidance will increase the jaw separation during protrusion. This factor cannot be modified. So in patients with steep condylar guidance incisal guidance is decreased to prevent the posterior jaw separation.

## Components of condylar guidance

- a). Horizontal condylar guidance-guides the forward movement for protrusive balance.
- b). Lateral condylar guidance-guides the sideward or lateral movement of the mandible.



Posterior slope of the articulator eminence represented by the condylar tract of articulator

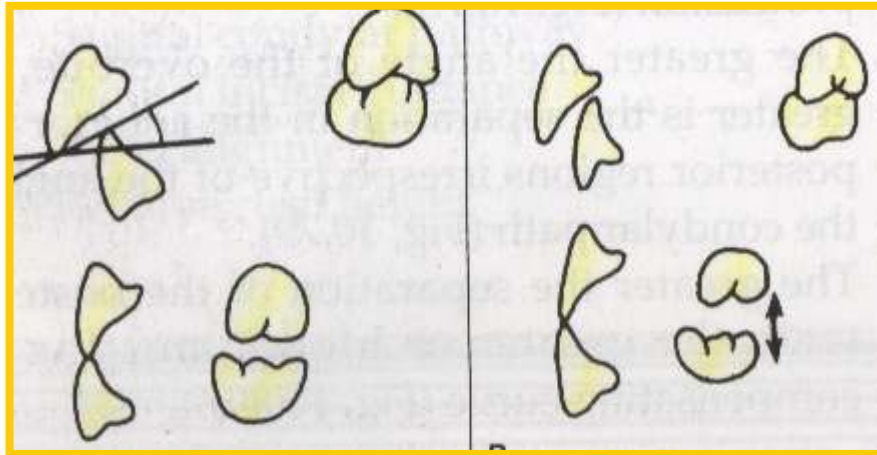
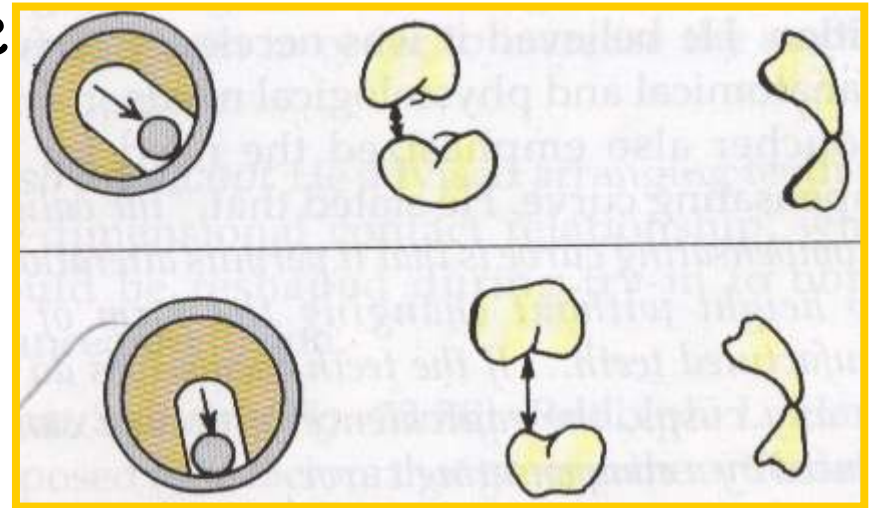


## (2).INCISAL GUIDANCE

Defined as *"The influence of the contacting surfaces of the mandibular and maxillary anterior teeth on mandibular movements"*

Determined by the dentist & customized during anterior try-in  
desired overjet & overbite are determined.  
If overjet is increased, the inclination of incisal guidance is decreased

Shallow condylar guidance  
produces lesser tooth  
separation during  
protrusion

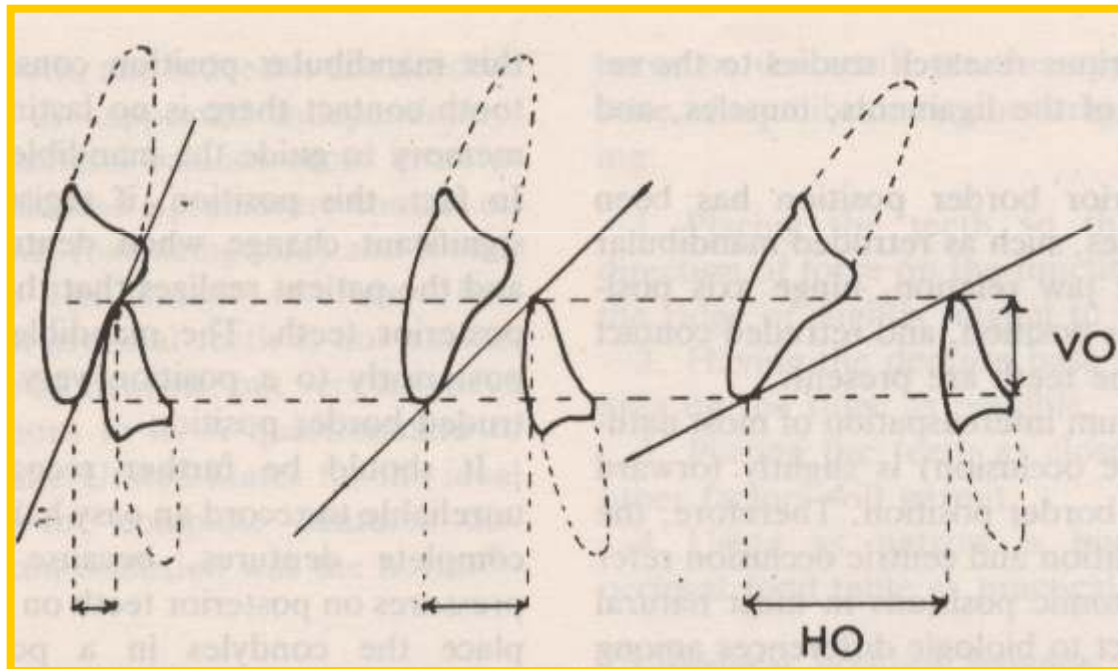


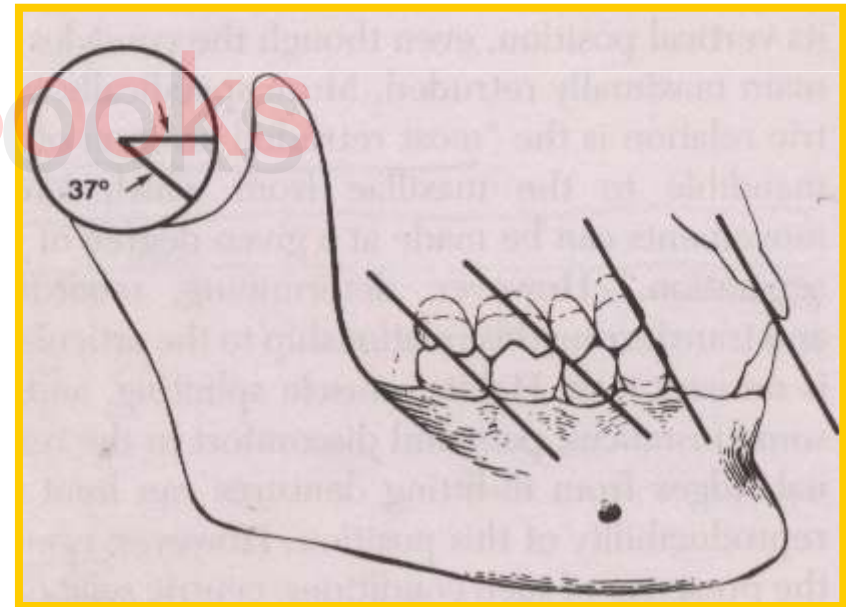
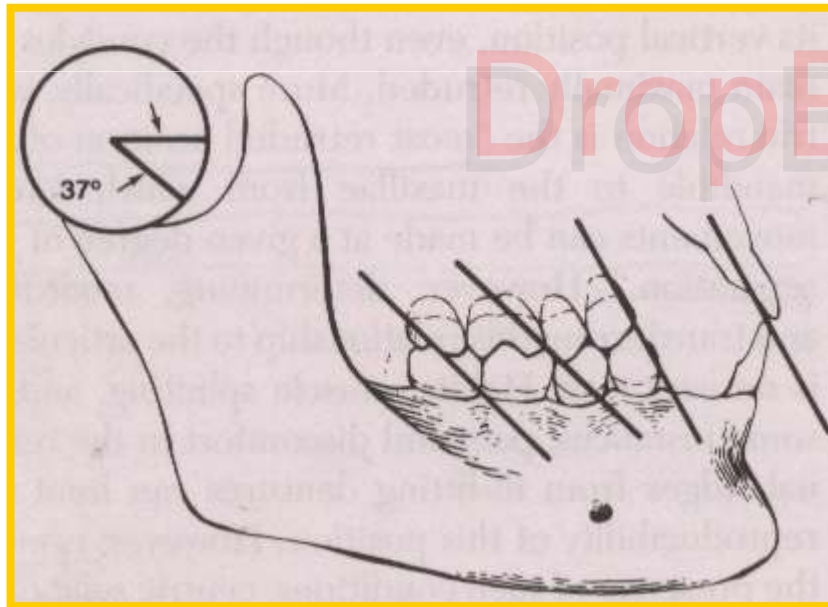
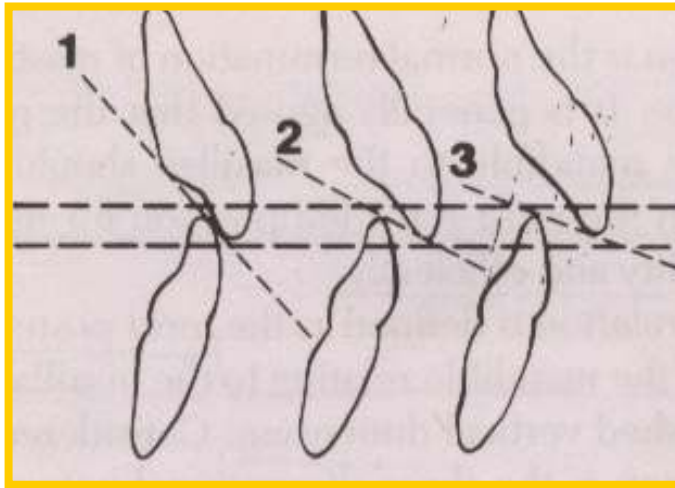
shallow incisal guidance  
lesser posterior teeth  
separation

- Z** Incisal guidance has more influence on posterior teeth than condylar guidance.
- Z** During protrusive movements mandibular teeth move downward & forward called as incisal guidance.
- Z** If the incisal guidance is steep, steep cusps or occlusal plane or steep compensatory curve is needed to balance occlusion.
- Z** Incisal guide angle should be acute with suitable vertical overlap and horizontal overlap to achieve vertical overlap and horizontal overlap to achieve balanced occlusion.

## Component of incisal guidance:

- 1). Horizontal component
- 2). Vertical component

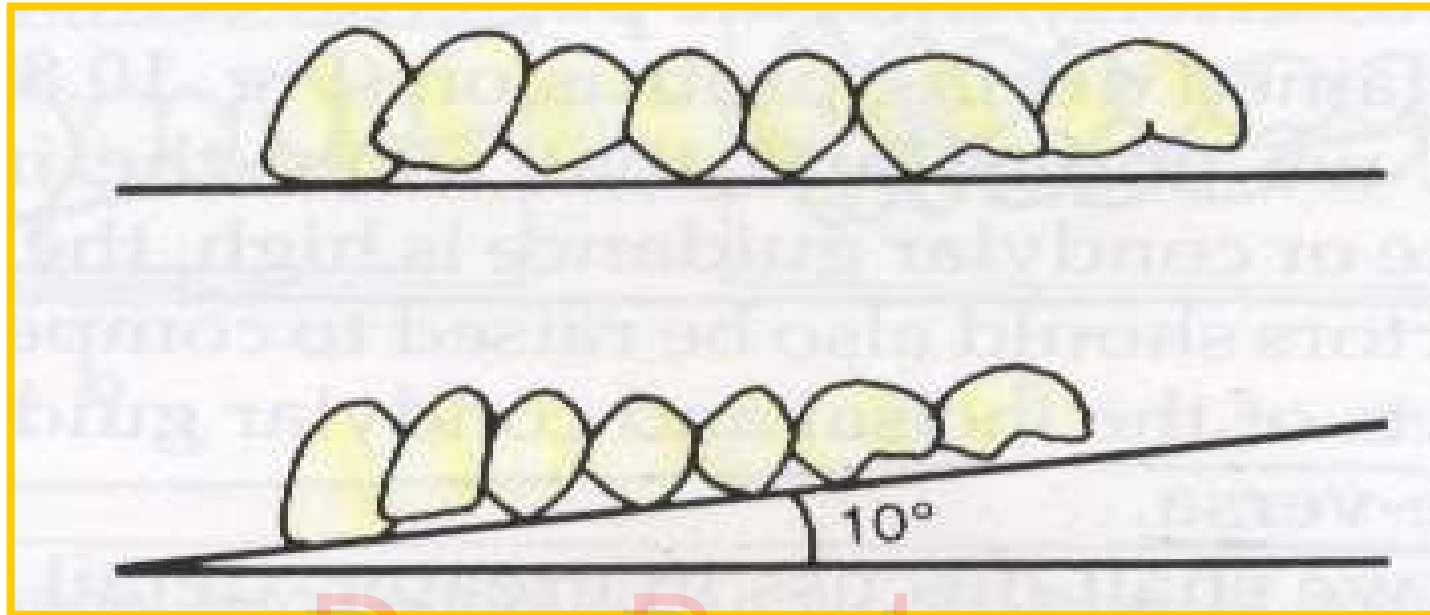




### 3). PLANE OF OCCLUSION OR OCCLUSAL PLANE-

*Defined as "An imaginary surface which is related anatomically to the cranium and which theoretically touches the incisal edges of the incisors & the tips of the occluding surfaces of posterior teeth. It represents the mean curvature of the surface.*

- Established anteriorly by height of lower canine and posteriorly by height of retromolar pad.
- Parallel to campher's line & tilting of the plane  $>10^\circ$  is not advisable

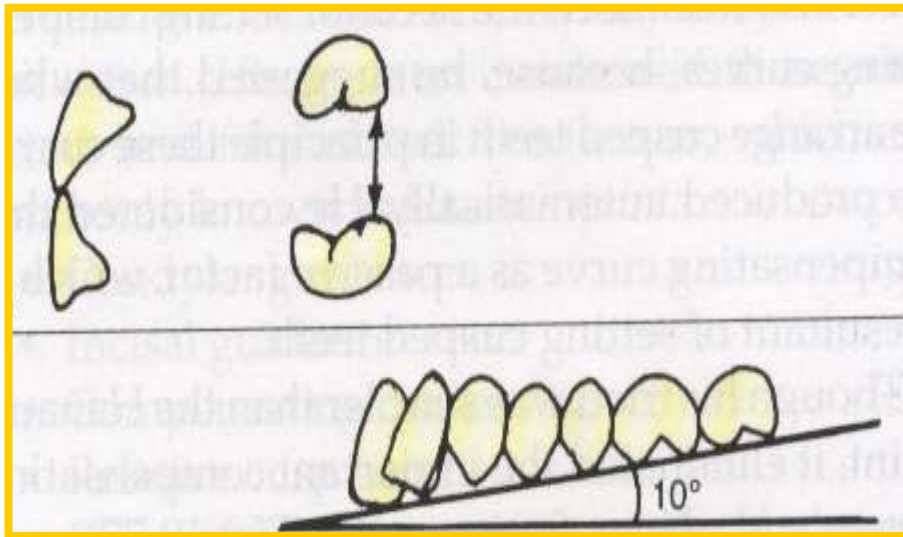
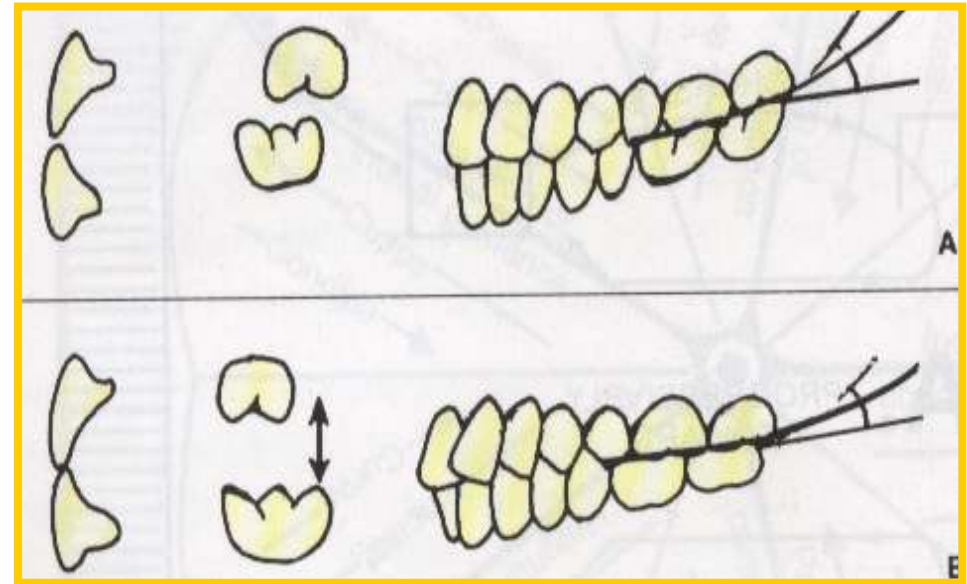


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The plane of occlusion can be altered to a maximum of 10°



posterior tooth separation during protrusion can be decreased by increasing the curve of spee.



Plane of orientation can also be altered to decrease the posterior tooth separation during protrusion.



#### 4). COMPENSATING CURVE

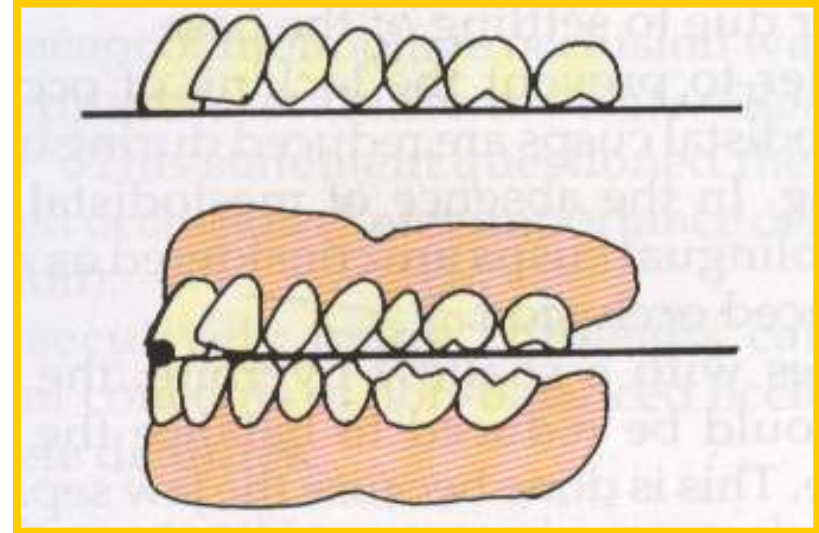
- *"The anterioposterior and lateral curvatures in the alignment of the occluding surfaces and incisal edges of artificial teeth which are used to develop balanced occlusion"*
- Determined by inclination of posterior teeth and their vertical relationship to occlusal plane.
- 2 types of curves
  - 1). Anterioposterior compensating curve-

a). Curve of spee-

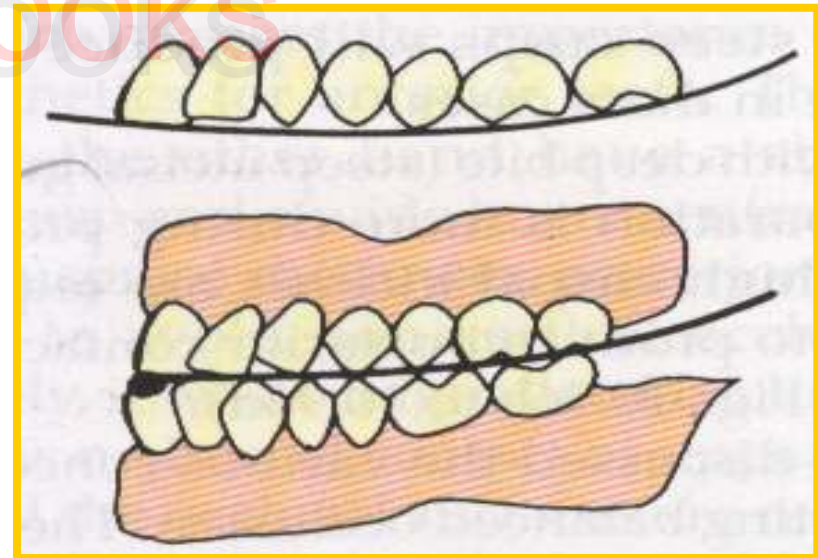
*"Anatomic curvature of the occlusal alignment of teeth beginning at the tip of lower canine and following the buccal cusps of the natural premolars and the molars, continuing to the anterior border of the ramus"* as described by Graf Von Spee.

Significance - when the patient moves his mandible forward, the posterior teeth set on this curve will continue to remain in contact. Thus avoiding disocclusion.

- Posterior teeth separation when the curve of spee not incorporated



- Incorporating the curve spee will provide posterior tooth contact during protrusion



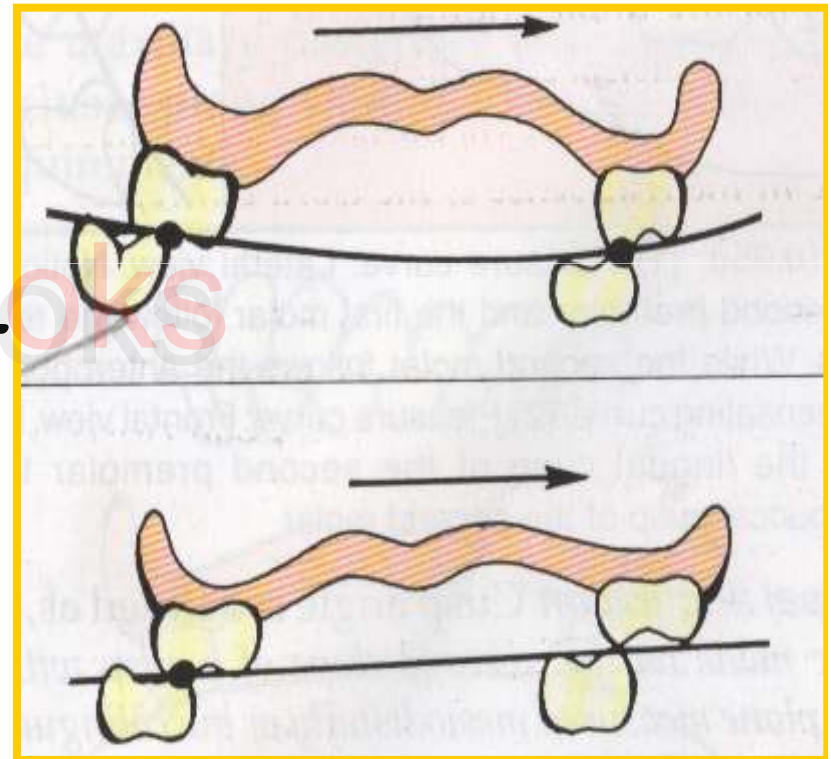
- ✓ Steep condylar path requires steep compensating curve to produce balanced occlusion
- ✓ Valuable factor as it allows dentist to alter cusp height without changing morphology of manufactured teeth
- ✓ Cusps can be made longer or shorter by inclining long axes of teeth to conform to end guidances
- ✓ If teeth themselves donot have any cusps,the compensating curve can be used to produce equivalent of cusps

## 2).Lateral compensating curves

### a).Compensating curve for Monson curve

*“ The curve of occlusion in which each cusp and incisal edge touches to a segment of the sphere of 8” in diameter with its center at glabella”*

- runs across the palatal & buccal cusps of maxillary molars.



## B-CURVE OF WILSON:

- GEORGE.H.WILSON mediolateral curve

- contacts buccal and lingual cusp tips of molars on each side of arch

In mandibular arch -results from inward inclination of lower posterior teeth-making lingual cusps lower than buccal cusps –curve being concave

In maxillary arch-results from outward inclination of posterior teeth-making buccal cusp higher than lingual cusps-curve being convex

Teeth set on this curve will have lateral balance of occlusion

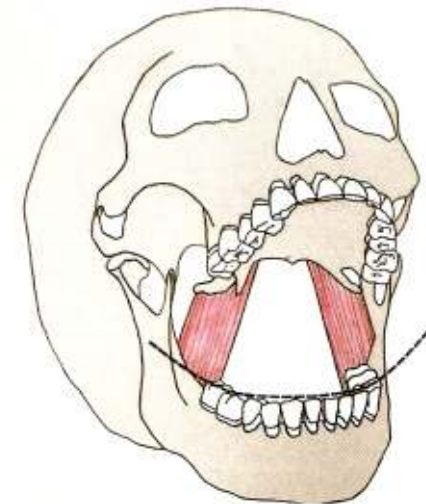
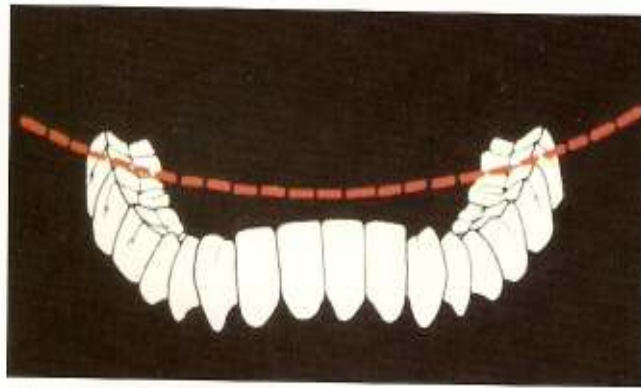


FIGURE 20-8 Alignment of the restorative tooth to parallel the alveolar ridge.

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FIG. 15-8. MEDIOLATERAL CURVE (WILSON'S CURVE).

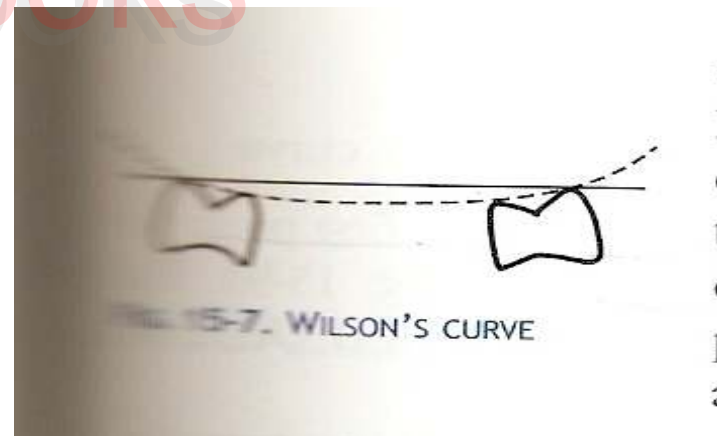
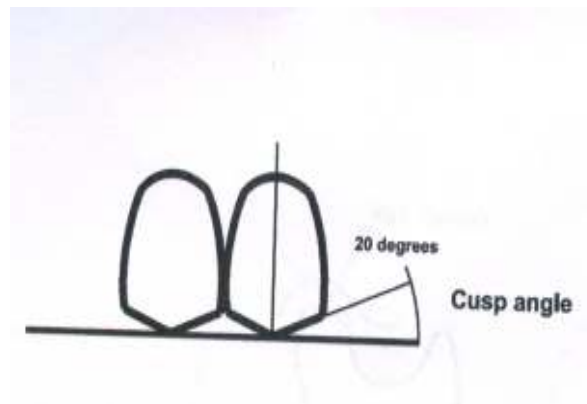


FIG. 15-7. WILSON'S CURVE

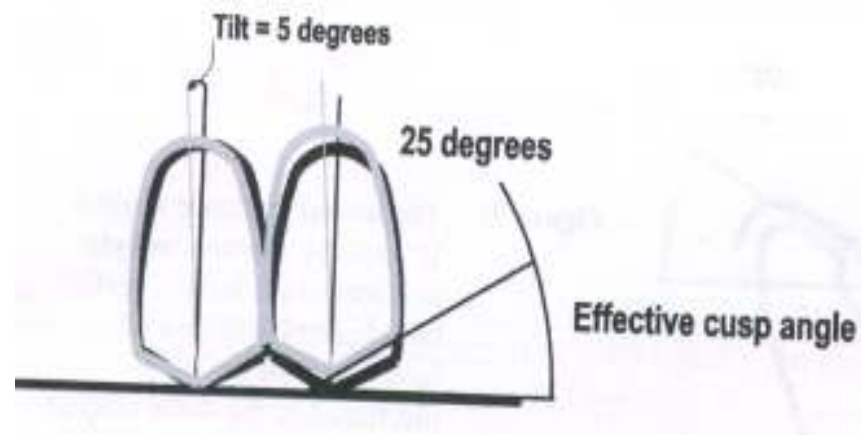
## 5-INCLINATION OF CUSPS OF TEETH

- ❑ CUSP ANGLE: angle made by average slope of cusp with cusp plane measured mesiodistally or bucco lingually





- ❑ CUSP PLANE: plane determined by two buccal cusp tips and highest lingual cusp of a molar
- ❑ EFFECTIVE CUSP ANGLE: angle formed by average cusp slope and horizontal reference plane

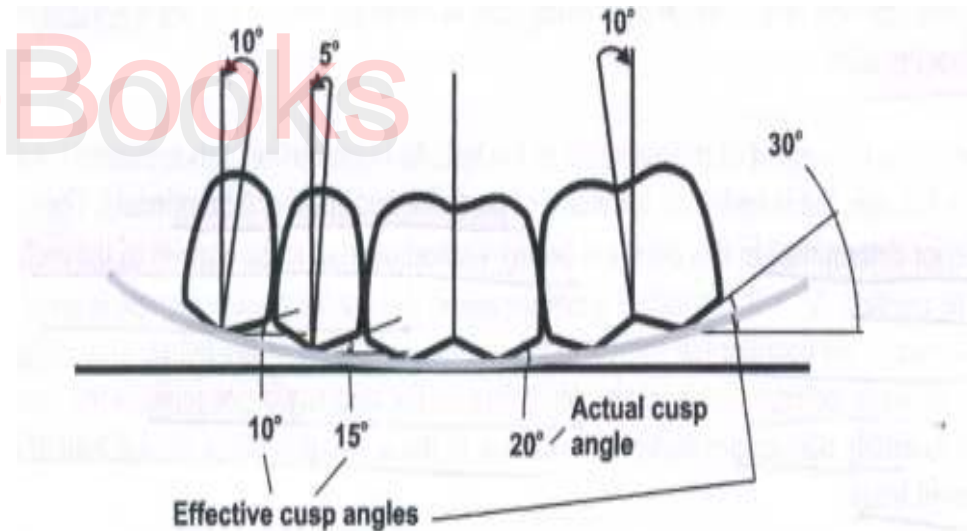
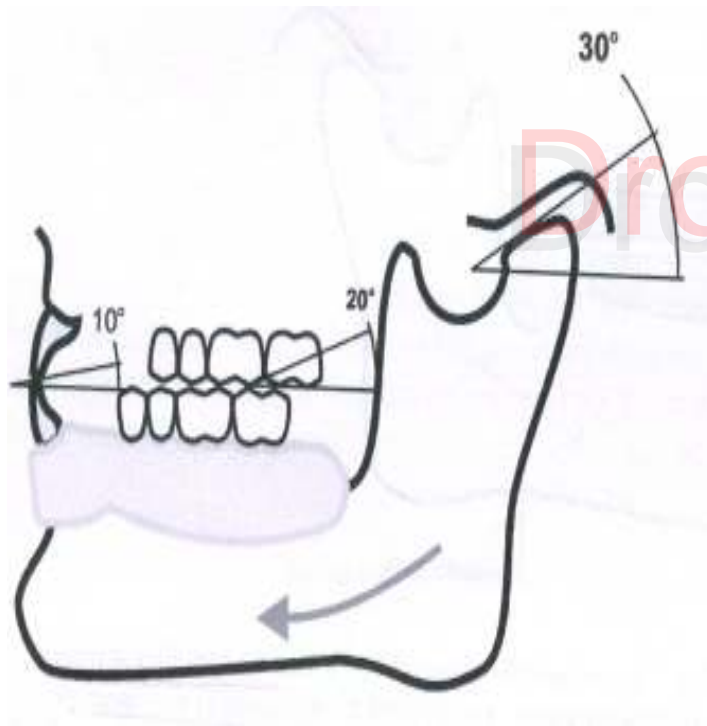


INCLINATION OF CUSPS-refers to angle between

Total occlusal surface of tooth and inclination of cusp  
i.r.t that surface

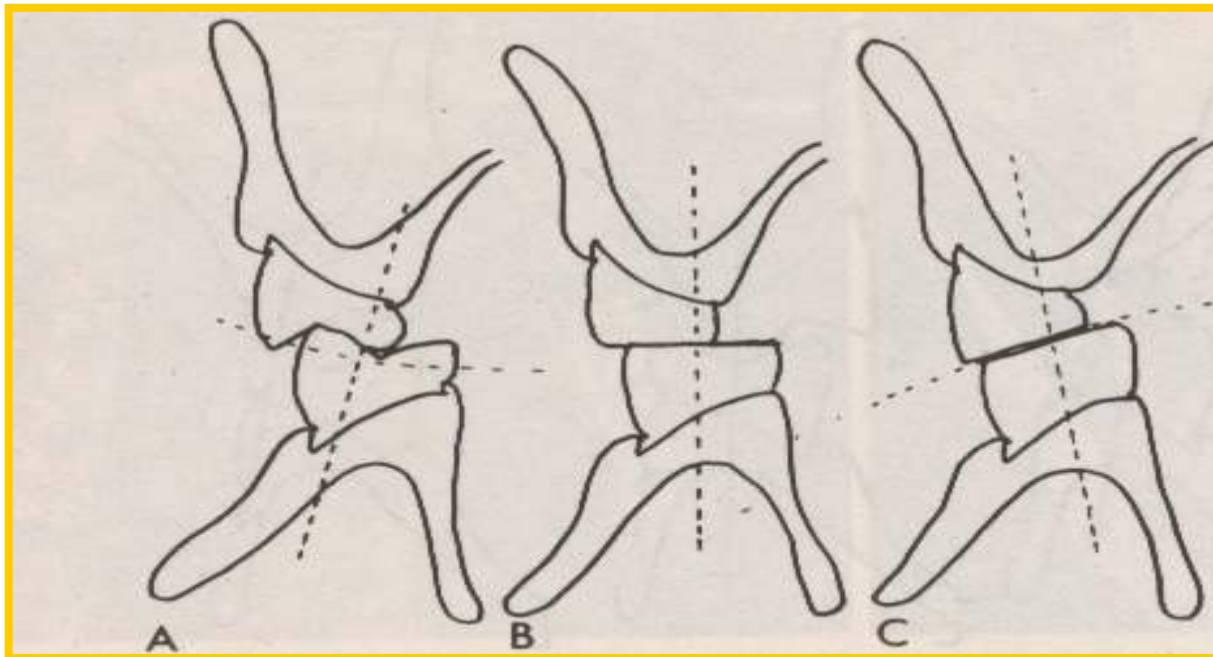
- ✓ Cuspal inclination can be made steeper when distal end of lower tooth is set higher than mesial end
- ✓ Cuspal inclination can be lowered if distal end is set lower than mesial end
- ✓ Similar adjustments can be made in buccal,lingual cusps

Tilting teeth i.e by correcting cuspal angles- effective cuspal angle can produce compensating curve – resulting in balanced occlusion



## General concepts of complete denture occlusion

- 1-Spherical concept:  
the anteroposterior & mesiodistal inclines of artificial teeth should be arranged in harmony with a spherical surface.



## 2-Centralizing occlusion

- This concept centralizing the working occlusal surface toward the center of the ridge antero-posterior ,in the area of bicuspids and the first molar.

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### 3) LINGUALISED

First proposed by Alfred Gysi in 1927.

1941 Payne desired a modification of anatomic teeth.

Involves the use of a large upper palatal cusp against a wide lower central fossa.

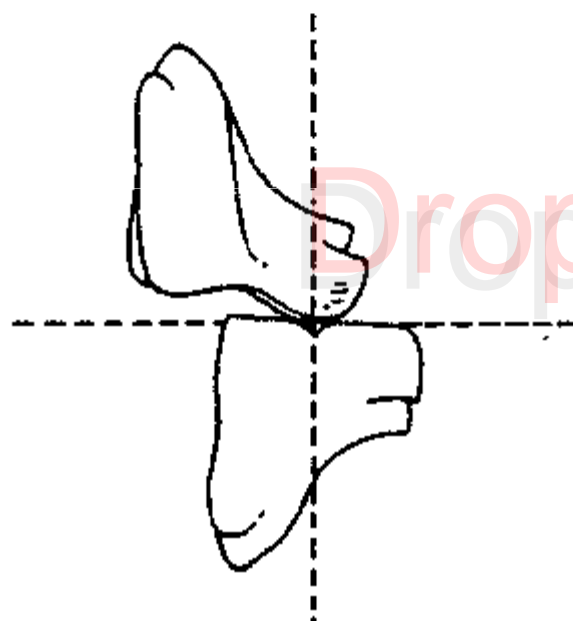
Buccal cusps of upper & lower teeth do not contact each other.



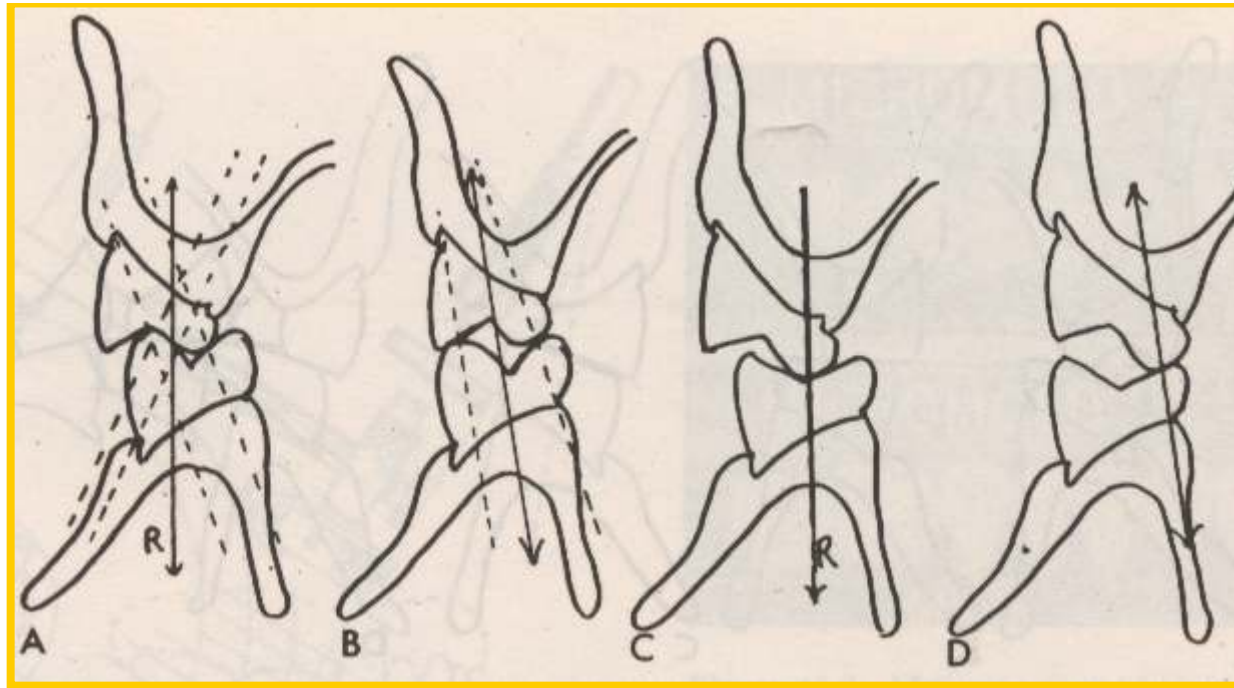
Normal occlusion

Lingualised occlusion





Relationship of upper ANATOLINE 10°  
to lower MONOLINE 0°



## Lingual contact occlusal scheme

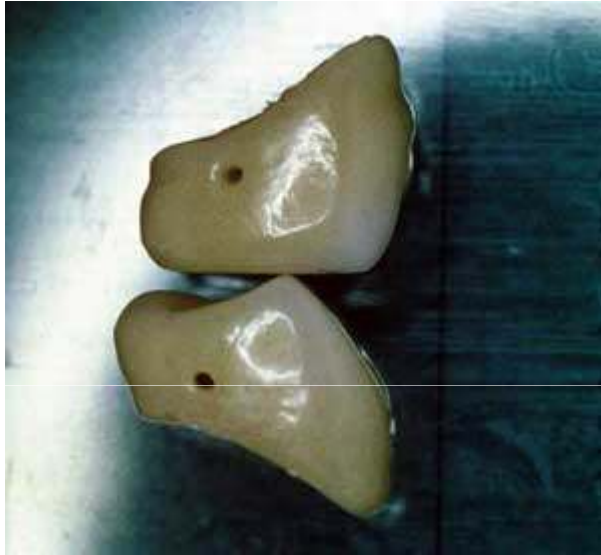
- Payne proposed the use of 30° anatomical teeth Myerson's lingualised Integration (MLI).
- Specialized tooth mould for arranging teeth in lingualized occlusion control contact (CC)



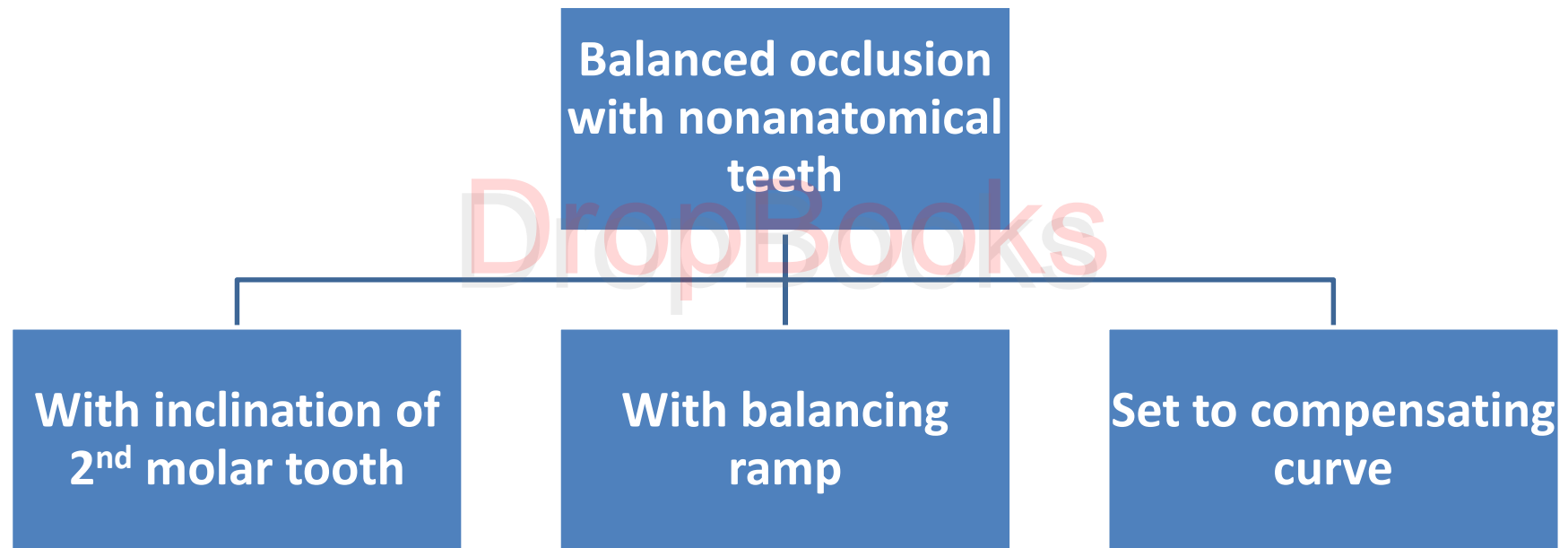
#### 4)FUNCTIONALLY GENERATED OCCLUSION:

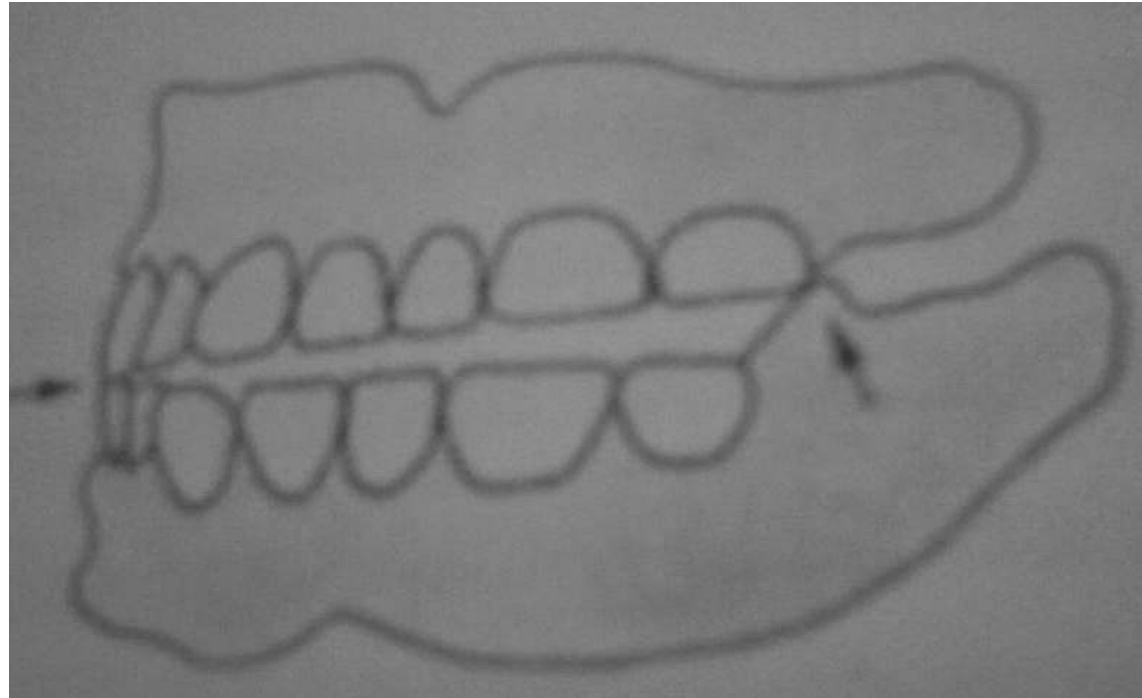
In this occlusion scheme, the maxillary teeth carve out a path in the wax placed on the lower occlusal table. This is known as 'functionally generated path'. Later the wax containing this path is replaced with cast gold or Cobalt alloy.

# 5-Linear occlusion



# Non-anatomic teeth





Balancing ramp

## Bilateral balance with balancing ramps

*Working*



*Balancing*



- In all lateral excursions you should observe at least three points of contact bilaterally ( both balancing ramps and anterior incisor contacts) to maintain bilateral balance.

# TOOTH FORMS OF POSTERIOR TEETH

F ANATOMIC TEETH ( $30^{\circ}$ )

F SEMI-ANATOMIC TEETH ( $<30^{\circ}$ )

F CUSPLESS TEETH (ZERO DEGREE)

**Teeth are selected according to the required occlusal scheme**